What is claimed is:

1. That method of making relative measurements, within a cross section of a primary ion beam consisting of a collection of a number of elementary beamlets, of the beamlets' intensity fluctuation, their emittance characteristics and their angular variations with respect to the centroid ray of said primary ion beam, which method comprises the following steps:

producing multiple elementary beamlets by impacting said ion beam on a suitably perforated mask, said beamlets being representative samples of said primary ion beam,

allowing said elementary beamlets to drift through a known distance, and thereafter,

allowing the elementary beamlets to impact a high spatial-resolution areal detector, whereby there is made possible the establishment of intensity variations between beamlets by measurement of the ion currents transported by each beamlet.

2. Method in accordance with Claim 1, including the step of establishing the emittance of individual beamlets by measuring the width of said beamlet impact pattern.

3, Method in accordance with Claim 1, including the step of establishing angular variations for individual beamlets with respect to the centroid trajectory of the primary ion beam.

4. Apparatus for making comparisons within the cross section of a primary ion beam of relative intensity, emittance and angular variations with respect to the centroid trajectory of the primary ion beam, comprising:

a perforated plate where the majority of the incoming primary ion beam is stopped;

said perforated plate including an assembly of apertures that allow diagnostic beamlets representative of local properties within the primary ion beam to pass to the down-stream side of said plate;

a high spatial resolution areal detector spaced a known distance from said perforated plate and so placed that said transmitted diagnostic beamlets drift through said known distance and impact said high spatial resolution areal detector where the areal distribution of current for each said beamlet is measured;

the magnitude of angular deflection of individual beamlets being established from the location of the pattern on the high spatial-resolution areal detector.

5 Apparatus in accordance with claim 4 where the size of said perforated mask is greater than the dimensions of said primary ion beam.

6 Apparatus in accordance with claim 4 where said apertures through said perforated plate are cylindrical holes.

7 Apparatus in accordance with claim 4 where said apertures through said perforated plate have the form of slots.

8 Apparatus in accordance with claim 4 where the array of perforations are arranged in a rectangular array.

9 Apparatus in accordance with claim 4 where the array of perforations are arranged in a close-packing array.

10 Apparatus in accordance with claim 4 where said high spatial-resolution areal detector is made from a conducting plate covered by an insulating layer onto which conductive elements are deposited across the surface of said conducting plate in the same geometry as the geometric distribution of said apertures through said perforated plate.

11 Apparatus in accordance with claim 10 where said conductor is a semiconductor.

12 Apparatus in accordance with claim 10 that allows measurement of ion currents arriving at each of the said conductive elements.

13. Apparatus in accordance with claim 4, including means for introducing relative motion between said plate and said high spatial-resolution areal detector, to permit beamlet angular deflection measurements.

14 Apparatus in accordance with claim 4 where the size of said perforated mask and high spatial-resolution areal detector is considerably smaller than that of said primary ion beam.

15 Apparatus in accordance with claim 14 where said perforated mask and high spatial-resolution areal detector are rigidly connected together and the assembly is scanned mechanically across the width of said primary ion beam.

16 Apparatus in accordance with claim 4 where the high spatial-resolution areal detector is a broad area secondary electron producer that directs said secondary electrons onto a suitable electron detector.

17 Apparatus in accordance with claim 16 where the said electron detector is a phosphorescent screen.